Art 34

CLAIMS

1. (amended) A method of etching, by a plasma of an etching gas in a processing vessel, a lower layer film of an organic material formed on a substrate, using an upper layer film of an Si-containing organic material as a mask, wherein

a mixed gas containing an NH_3 gas and an O_2 gas is supplied into the processing vessel as the etching gas,

a CD shift value of etching is controlled by adjusting a flow ratio of the O_2 gas to the NH_3 gas,

the plasma is formed between a pair of opposed electrodes disposed in the processing vessel, and

a residence time represented by V/S takes a value from 20 to 60 msec, where V (m^3) represents an effective processing space volume as a product of an area of the substrate and a distance between the electrodes, and S (m^3/sec) represents a gas exhaust velocity from the processing vessel.

2. The etching method according to claim 1, wherein

a pressure in the processing vessel is not less than 2.7 Pa and less than 13.3 Pa.

3. (amended) The etching method according to claim 1, wherein

a pressure in the processing vessel is not less than 6.7 Pa and less than 13.3 Pa.

4. (amended) The etching method according to claim 1, wherein

a temperature of a support member supporting the substrate in the processing vessel is from 0 to 20°C.

5. The etching method according to claim 1, wherein

the substrate has a surface layer to be etched with the lower layer film used as a mask, the surface layer being formed under the lower layer film.

6. The etching method according to claim 1, wherein

the etching method is carried out by a capacitively coupled

plasma etching system, which forms a high-frequency electric field between a pair of opposed electrodes disposed in the processing vessel to generate the plasma.

7. (amended) A method of etching, by a plasma of an etching gas in a processing vessel, a lower layer film of an organic material formed on a substrate, using an upper layer film of an Si-containing organic material as a mask, wherein

a mixed gas containing an NH_3 gas and an O_2 gas is supplied into the processing vessel as the etching gas,

a flow ratio of the O_2 gas to the NH_3 gas is from 0.5 to 20%,

the plasma is formed between a pair of opposed electrodes disposed in the processing vessel, and

a residence time represented by V/S takes a value from 20 to 60 msec, where V (m^3) represents an effective processing space volume as a product of an area of the substrate and a distance between the electrode, and S (m^3/sec) represents a gas exhaust velocity from the processing vessel.

8. The etching method according to claim 7, wherein

the flow ratio of the O_2 gas to the NH_3 gas is from 5 to 10%.

9. The etching method according to claim 7, wherein

a pressure in the processing vessel is not less than 2.7 Pa and less than 13.3 Pa.

10. (amended) The etching method according to claim 7, wherein

a pressure in the processing vessel is not less than 6.7 Pa and less than 13.3 Pa.

11. (amended) The etching method according to claim 7, wherein

a temperature of a support member supporting the substrate in the processing vessel is from 0 to 20°C.

12. The etching method according to claim 7, wherein

the substrate has a surface layer to be etched with the lower layer film used as a mask, the surface layer being formed under the

under the lower layer film.

13. The etching method according to claim 7, wherein

the etching method is carried out by a capacitively coupled plasma etching system, which forms a high-frequency electric field between a pair of opposed electrodes disposed in the processing vessel to generate the plasma.